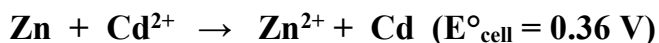


Question Bank for Electrochemistry II

- Q.1** Define Kohlrausch's Law of independent migration of ions? How it is useful in calculation of equivalent conductance at infinite dilution, ionic mobility, degree of dissociation and dissociation constant?
- Q.2** What do you mean by transport number? Describe the principle of Hittorf's Method for determination of transport number of cation and anion?
- Q.3** Explain conductometric titrations by taking different case study of titration of given acid solution with base solution?
- Q.4** Molar conductance at infinite dilution of Na^+ and Cl^- are 49.79×10^{-4} and $75.39 \times 10^{-4} \text{ S m}^2 \text{ mol}^{-1}$ respectively. Calculate the transport number of cation and anion?
- Q.5** How do conductance, specific conductance, molar conductance and equivalent conductance vary with dilution and why?
- Q.6** The resistance of 0.009 M solution of an electrolyte was found to be 270 ohm at 25°C . Calculate the molar conductance of this solution provided cell constant is 0.88 cm^{-1} .
- Q.7** What do you mean by ionic product of water and solubility product of sparingly soluble salt?
- Q.8** If equivalent conductance at infinite dilution of NaCl, HCl and CH_3COONa are 126.4, 426.1 and $91.0 \text{ ohm}^{-1}\text{cm}^2\text{g eq}^{-1}$ respectively and specific conductance of 0.01 M acetic acid solution is $1.63 \times 10^{-4} \text{ S cm}^{-1}$. Calculate equivalent conductance of acetic acid at infinite dilution, degree of dissociation and dissociation constant of acid?
- Q.9** Define the terms Specific conductance, Molar conductance, Equivalent conductance, Ionic mobility, Conductance, Ionic conductance with formula?
- Q.10** What are the factors upon which transport number depends? Briefly describe Moving Boundary method for transport number determination?
- Q.11** The specific conductance of saturated solution of AgCl in pure water at 298K is $1.26 \times 10^{-6} \text{ ohm}^{-1}\text{cm}^{-1}$ higher than that of water used. The equivalent conductances at infinite dilution of AgNO_3 , HNO_3 and HCl are 132.8, 421.2 and $426.9 \text{ ohm}^{-1}\text{cm}^{-1}$ respectively. Calculate solubility of AgCl at 25°C ?
- Q.12** Discuss the titration curve obtained in conductometric titration of acetic acid with NH_4OH , sodium acetate solution with hydrochloric acid?
- Q.13** Explain Arrhenius theory, Ostwald's Dilution Law and D.H.O.equation?

Question Bank of Electrochemistry I

- Q.1** Define an Electrochemical cell. Taking Zn-Cu electrochemical, explain its working along with chemical reactions, draw its diagram and give its representation? Mention functions of salt bridge?
- Q.2** Explain the term electrode potential and standard electrode potential. Derive Nernst equation for describing effect of concentration of electrolyte on electrode potential. Also calculate electrode potential of zinc electrode placed in 0.01 M solution of ZnSO_4 at 25°C . Provided $E^0_{(\text{Zn}^{2+}, \text{Zn})} = -0.76 \text{ V}$
- Q.3** What do you mean by Electrochemical Series and explain its applications?
- Q.4** Discuss the principle of potentiometric titrations? Briefly explain how following titrations can be carried out potentiometrically?
(a) Acid-base titrations (b) Redox titrations (c) Precipitation titrations
- Q.5** For the reaction $\text{Zn(s)} + 2\text{AgCl(s)} \rightarrow \text{ZnCl}_2(0.555 \text{ M}) + 2\text{Ag(s)}$
EMF at 0°C is 1.015 V while Temp. coefficient of EMF is -4.02×10^{-4} volt per degree. Find Enthalpy change, Entropy change and Gibbs free energy change?
- Q.6** What are reversible and ir-reversible cell? Explain with suitable example?
- Q.7** Differentiate between Electrolytic cell and Electrochemical Cell?
- Q.8** Can a solution of 1 M CuSO_4 be stored in a vessel made of nickel metal? Given that $E^0_{(\text{Ni}, \text{Ni}^{2+})} = +0.25 \text{ V}$, $E^0_{(\text{Cu}, \text{Cu}^{2+})} = -0.34 \text{ V}$
- Q.9** Explain following electrodes with representation and respective half cell rxn
(a) Calomel electrode (b) Redox electrode (c) Quinhydrone electrode
- Q.10** Describe the construction and working of Standard Hydrogen Electrode? How it is useful in measurement of given electrode potential?
- Q.11** Define the following terms:-
(a) Overvoltage (b) Activity coefficient (c) Decomposition potential
(d) Liquid Junction potential (e) Polarisation (f) Electro-motive force
- Q.12** Explain Chemical cell and Concentration cell with and without transference by taking suitable example, derive expression for EMF of such cells?
- Q.13** Calculate the equilibrium constant for the following reaction



Question Bank for Phase Equilibria

- Q.1 Define the following terms by taking suitable examples:-**
(a) Phase (b) Component (c) Degree of freedom/Variance
- Q.2 Construct and explain phase diagram of KI-H₂O system. Apply phase rule to the diagram and describe the formation of eutectic mixture by the components. Discuss the formation of freezing mixtures by addition of suitable salts to ice?**
- Q.3 Differentiate between Gibb's Phase Rule and Reduced/Condensed Phase Rule?**
- Q.4 Draw and explain phase diagram of H₂O system and discuss the effect of temperature at constant pressure?**
- Q.5 Explain the following terms**
(a) Critical temperature (b) Triple point of H₂O (c) Cryohydrate point
(d) Pattinson's process (e) Metastable equilibrium (f) Solubility curve
- Q.6 How Eutectic system, Eutectic point, Eutectic mixture, Eutectic temperature and Eutectic composition are related to each other?**
- Q.7 Draw well labelled phase diagram of lead-silver system and explain application of this diagram in extraction of silver from an ore of lead (Desilverization)?**
- Q.8 Discuss how Freeze Drying, Flash Evaporation and Refreezing/Regelation can be explained with the help of application of phase diagram of water?**
- Q.9 What are advantages and limitations of Gibb's Phase Rule?**
- Q.10 Determine the number of phases, components and degree of freedom for the following system:-**
(a) $\text{NH}_4\text{Cl (s)} \rightarrow \text{NH}_3 \text{ (g)} + \text{HCl (g)}$
(b) Solution of acetic acid in water
- Q.11 Derive the formula for the following colligative properties:-**
(a) Relative lowering of vapour pressure
(b) Elevation in boiling point
(c) Depression in freezing point
- Q.12 3.6 gm of non-volatile solute is dissolved in 0.100 Kg of acetone at 25°C. The vapour pressure of solution is 182.5 mm of Hg. Calculate the molecular weight of solute if vapour pressure of acetone at 25°C is 185 mm of Hg?**
- Q.13 Find the freezing point of solution prepared by dissolving 0.25 gm of solute having molecular weight of 55 gm in 0.02 kg of water. Given $K_f = 1.84^\circ\text{C}$?**

Question Bank for FUELS

- Q.1 Define Cetane number and Octane Number of fuels and explain their role in Internal Combustion engine?**
- Q.2 What do you mean by Proximate and Ultimate analysis of coal to assess the quality of coal?**
- Q.3 Explain the following terms:-**
(a) Knocking (b) Compression ratio (c) Power alcohol
(d) Bergius process (e) Leaded petrol (f) Anti-knocking additives
(g) Fischer-Tropsch process (h) Catalytic polymerization
- Q.4 What do you mean by calorific value? Discuss its different types and mention units of calorific value in S.I and C.G.S. system?**
- Q.5 Describe ten important characteristics of Good fuel for commercial use?**
- Q.6 How calorific value of a fuel can be determined using Dulong's formula?
A coal sample has the following ultimate analysis: Carbon (60%), Hydrogen (6%), Oxygen (3.3%), Sulphur (0.5%), Nitrogen (0.2%) and Ash (0.3%). Calculate calorific value of fuel using Dulong's formula?**
- Q.7 Briefly summarize the process of formation of Biodiesel from vegetable oils? Also mention applications of such biodiesel?**
- Q.8 Discuss the principle, construction, working and observations of Bomb Calorimeter for determination of calorific value of given fuel?**
- Q.9 0.250 gm of coal was analysed for carbon and hydrogen. The increase in weights of CaCl_2 bulb and KOH bulb was found to be 0.15 gm and 0.1837 gm respectively. Calculate the % composition of carbon and hydrogen in it?**
- Q.10 What do you mean by alternative fuel? Give two methods for preparation of Synthetic petrol and Power alcohol along with its applications?**
- Q.11 A sample of coal was analysed as follows:- 1.0 gm of air dried coal sample was weighed in silica crucible. After heating for 1 hr at 105-110 °C, dry coal residue weighed 0.985 gm. The crucible was covered with vented lid and then heated for exactly 7 minutes at 950 °C. The residue weighed 0.800 gm. The crucible was then heated strongly in air, until constant weight was obtained. The residue was found to weigh 0.100 gm. Calculate the proximate analysis?**

Q.12 Explain the working of petrol and diesel engines?

Q.13 The determination of calorific value of a coal sample gave following data:-

Weight of coal sample = 0.9 gm
Weight of water = 2.560 Kg
Water equivalent of calorimeter = 440 gm
Rise in temperature = 2.42 °C
Cooling correction = 0.052 °C
Fuse wire correction = 10.0 calories

Calculate the gross calorific value and net calorific value, if coal contains 8% hydrogen and latent heat of steam is 800 calories/gm.

RBT Classification	Lower Order Thinking Levels (LOTS)			Higher Order Thinking Levels (HOTS)		
RBT Level Number	L1	L2	L3	L4	L5	L6
RBT Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
